



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/883,981	06/20/2001	John W. Andrews	BU9-98-225 DIV	3116

21254 7590 12/30/2002

MCGINN & GIBB, PLLC  
8321 OLD COURTHOUSE ROAD  
SUITE 200  
VIENNA, VA 22182-3817

EXAMINER

BLUM, DAVID S

ART UNIT	PAPER NUMBER
----------	--------------

2813

DATE MAILED: 12/30/2002

13

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/883,981

Applicant(s)

ANDREWS ET AL.

Examiner

David S Blum

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 20 November 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 8, 15 and 23-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 8, 15 and 23-38 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 8, 15, 23-38 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 8, 15, 23, 29, 31, and 32 contain the limitation where the trench filler is a non-nitrided filler material. This is not taught or suggested in the specification as originally presented. The specification on page 6 recites "the oxide material" (line 7) and "HDP oxides" (line 15), but does not teach non-nitrided oxides". Although the terms oxide and HDP oxides would include non-nitrided oxides, the terms would also include nitrided oxides. The other claims not specifically listed as reciting "non-nitrided" depend upon either claim 8, 15, or 23, and therefore contain the limitation.

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

Art Unit: 2813

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 8, 15, 24-27, 29-32, and 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zheng (US 5,728,621) in view of Liao (US 6,110,795)

Zheng teaches the device of claims 8, 15, 24-27, 29-32, and 34-35 except for reciting that the trench fill is "seamless" and "substantially scratch free" and co-planar with the substrate. Zheng teaches the device structure of claims in that a thin oxide layer (12) is grown on the substrate (including the non-trench region) as in claim 34, and wide and narrow shallow trenches (figure 6) are formed on a substrate, and the trenches are filled by a non-conformal high density plasma method (18) and the filler is removed from the pad leaving trench fill in the trench and a planar surface. Figure 7 shows the trench fill and the substrate to be co-planar as in figure 6 of the instant application. As the claims are in the format of device (structure) claims, process limitations are given little weight. The filler material is silicon oxide by a high density plasma method (column 3 lines 45-47). It is the high density plasma trench fill method that results in the seamless trench fill (per instant application). It is obvious that as the process steps are like, the results will be the same. Zheng is also silent as to the surface being scratchless, but teaches the trench fill may be either optionally polished or selectively etched (suggested method) to the pad layer (column 3 lines 15-25). Zheng teaches further removal of the trench fill may be optional.

Art Unit: 2813

Liao also teaches using selective etching (not reactive ion etching) to avoid micro-scratches caused by polishing, but does not etch down to the substrate level. Thus, Zheng teaches a method which will result in the structure being substantially scratch free and Liao teaches which of the methods will yield the desired result. As defined by the specification, chatter marks are caused by CMP and by Liao teaching away from CMP to avoid micro-scratches, the lack of polishing will also eliminate chatter marks.

It would be obvious to one skilled in the requisite art at the time of the invention to modify Zheng by choosing a removal method taught by that will result in a substantially scratch free surface as taught by Liao with reasonable expectation of producing a trench fill with a planar surface with reduced surface flaws (Zheng, background, Liao).

3. Claim 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zheng (US 5,728,621) in view of Liao (US 6,110,795) and in further view of Brewer (US 6,322,600).

Zhang and Liao teach all of the parts of the substrate as claimed as recited above except for doping the trench fill. Brewer teaches filling a trench with a dielectric that includes one of BPSG (boron doped oxide glass), PSG (phosphorous doped oxide glass) and HDP oxides. Thus it is known to have a doped insulation trench fill and to obtain the desired dielectric properties, one skilled in the art would know to dope HDP oxide to achieve a dielectric constant to match that of a BPSG or PSG.

It would be obvious to one skilled in the requisite art at the time of the invention to modify Zhang and Liao by adding dopant to the oxide trench fill as suggested by Brewer to produce a trench fill of a desired dielectric constant.

4. Claims 23, 33, and 36-38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zheng (US 5,728,621) in view of Liao (US 6,110,795) as applied to claim 8 above, and further in view of Wolf.

Zheng and Liao teach all of the device of claims 23, 33, and 36-38 as recited above except for the upper surface of the non-trench region containing implanted dopants. Wolf (pages 48, 58, and 522-523) teaches various transistors in a semiconductor substrate, all with implanted dopants at the upper surface of the non-trench region. On page 48, Wolf teaches Boron (as in claim 37) as the dopant. As the purpose of isolation trenches is to separate devices, including transistors, and that such devices would have dopants in the non-isolation surface, it is obvious that a complete structure would have dopants at the upper surface of the non-trench region as conventional practice.

It would be obvious to one skilled in the requisite art at the time of the invention to modify Zheng and Liao by having dopants such as boron as taught by Wolf to be conventional practice, to produce an isolation trench that separates devices.

***Response to Arguments***

5. Applicant's arguments with respect to claims 8, 15, and 23-35 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.


Art Unit: 2813

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Blum whose telephone number is (703)-306-9168 and e-mail address is [David.blum@USPTO.gov](mailto:David.blum@USPTO.gov).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr., can be reached at (703)-308-4940. Our facsimile number for Before-Final Communications is (703)- 872-9318 and for After-Final Communications is (703)- 872-9319. The facsimile number for customer service is (703)-872-9317. Our receptionist's number is (703)-308-0956.

David S. Blum

December 26, 2002

  
CARL WHITEHEAD, JR.  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800